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**AQUATIC INVERTEBRATES AND HABITAT AT A FIXED
STATION ON THE GALLATIN RIVER,
GALLATIN COUNTY, MONTANA**

July 12, 2001

**A report to
the Montana Department of Environmental Quality
Helena, Montana**

**by
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INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Gallatin River near Logan, Montana on July 12, 2001. The sample site was located by GPS reading at 45° 53' 15" N, 111° 28' 41" W, lying within the Montana Valley and Foothill Prairie Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of either a composite of four Hess samples, or a one-minute kicknet collection (Bukantis 1998). Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the revised method (Bollman 1998) for streams of Western Montana's ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity.

The revised bioassessment metric battery and its scoring criteria have not been evaluated for application to higher-order streams and rivers; to date, no bioassessment method has been contrived for these waterways in Montana. Thus, the method used here is likely to have limitations in its applicability to the sites in this study. For example, 24 of the riverine or high-order waterways sampled for the fixed station study were located within Western Montana ecoregions and were sampled between July 23 and August 25, 2001. Mean water temperature for these sites at the time of sampling was 19.8°C (median = 19.4°). Temperatures ranged from 15.5°C (Kootenai River near Libby) to 25.3°C (Jefferson River near Three Forks). Ninety-eight sites from Western Montana were used to assemble the revised metric battery and to test it for sensitivity in detecting impairment, to establish scoring criteria, and to improve robustness of bioassessment. These 98 sites were mainly second and third order streams; the sampling season roughly corresponded to that of the fixed-station study. Mean water temperature for these sites at the time of sampling was 15°C (median = 14°C). Natural variations in benthic community composition and structure along longitudinal and thermal gradients are well known phenomena. Thus, scores and classifications were established for much smaller systems with significantly lower water temperatures; impairment classifications and use support designations in this study must be interpreted with care. Results from the application of other metric batteries may be found in the Appendix.

RESULTS AND DISCUSSION

Table 1 itemizes the nine evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat scored sub-optimally. Channel alterations were evident on the left bank of the river, streambanks were judged only moderately stable at best. Bank vegetation was obviously disrupted on both banks. The riparian zone was abbreviated. Instream habitats were perceived to be affected by sediment deposition and by embeddedness of substrate particles.

Table 1. Stream and riparian habitat assessment for a fixed station on the Gallatin River. July 2001.

Max. possible score	Parameter	Gallatin River near Logan
10	Riffle development	9
10	Benthic substrate	9
20	Embeddedness	14
20	Channel alteration	7
20	Sediment deposition	13
20	Channel flow status	14
20	Bank stability: left / right	4 / 7
20	Bank vegetation: left / right	3 / 5
20	Vegetated zone: left / right	6 / 8
160	Total	99
	Percent of maximum CONDITION*	62 SUB-OPTIMAL

*Condition categories: Optimal > 80% of maximum score; Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%. Adapted from Plafkin et al. 1998.

Table 2. Metric values, scores, and bioassessment for a fixed station on the Gallatin River. The revised bioassessment metric battery (Bollman 1998) was used for the evaluation. July 2001.

	Gallatin River near Logan	
METRICS	METRIC VALUES	METRIC SCORES
Ephemeroptera richness	4	2
Plecoptera richness	1	1
Trichoptera richness	8	3
Number of sensitive taxa	0	0
Percent filterers	26.9	0
Percent tolerant taxa	44.4	0
	TOTAL SCORE (max.=18)	6
	PERCENT OF MAX.	33
	Impairment classification	MODERATE
	USE SUPPORT	PARTIAL

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on the Gallatin River is moderately impaired and only partially supports designated uses.

The moderately elevated biotic index value (4.50) and the depressed mayfly taxa richness (4) suggest that water quality may have been impaired by warm temperatures, nutrient enrichment, or both. The measured water temperature at the time of sampling was 23.2°C, a figure higher than the mean temperature at riverine sites in Western

Montana visited for the fixed station study. Tolerant taxa comprised 44% of the sampled assemblage, suggesting that a combination of impacts may have been present.

Fourteen “clinger” taxa and 8 caddisfly taxa were present in the sample, suggesting that ample hard substrates were available for colonization and implying that fine sediment deposition may have been limited to slower-flowing areas. Taxa richness (28) was somewhat limited, and few predators (4 individuals in 2 taxa) were captured, suggesting that instream habitats may have been limited by embeddedness or other factors. Only a single stonefly specimen was present in the sample; low stonefly richness and abundance may be associated with impairment of reach-scale habitat features, such as riparian zone function, streambank stability, or integrity of natural channel morphology.

All expected functional components of a healthy benthic assemblage appeared to be present in appropriate proportions.

CONCLUSIONS

- Warm water temperatures and nutrient enrichment appeared to affect the taxonomic composition and tolerance characteristics of the benthic assemblage at this site on the Gallatin River.
- Instream habitat may have been limited by embedded substrate or other factors.
- Low stonefly richness and abundance may have been associated with disturbances to reach-scale habitat features.
- While the impairment classification assigned to this site by the bioassessment method used seems to be appropriate, the bioassessment score may underestimate the quality of the benthic fauna to some degree. In particular, the contribution of filter-feeders seems to be appropriate for a riverine environment.

LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Master's (M.S.) Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft, April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Woods, A.J., Omernik, J. M. Nesser, J.A., Sheldon, J., and Azevedo, S. H. 1999. Ecoregions of Montana. (Color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia. US Geological Survey.

APPENDIX

Taxonomic data and summaries

Gallatin River

July 2001

Aquatic Invertebrate Taxonomic Data

Site Name: Gallatin River near Logan

Date: 7/12/01

Site ID: M05GALLR01

Approx. percent of sample used: 7

Taxon	Quantity	Percent	HBI	FFG
<i>Pisidium</i> sp.	1	0.31	8	CF
Physidae	2	0.62	8	SC
<i>Acari</i>	1	0.31	5	PA
Total Misc. Taxa	4	1.23		
<i>Acentrella insignificans</i>	2	0.62	4	CG
<i>Baetis tricaudatus</i>	38	11.73	4	CG
<i>Attenella margarita</i>	4	1.23	2	CG
<i>Tricorythodes minutus</i>	5	1.54	4	CG
Total Ephemeroptera	49	15.12		
<i>Claassenia sabulosa</i>	1	0.31	3	PR
Total Plecoptera	1	0.31		
<i>Brachycentrus occidentalis</i>	40	12.35	2	CF
<i>Glossosoma</i> sp.	1	0.31	0	SC
<i>Helicopsyche borealis</i>	56	17.28	3	SC
<i>Cheumatopsyche</i> sp.	12	3.70	5	CF
<i>Hydropsyche</i> sp.	18	5.56	5	CF
<i>Hydroptila</i> sp.	2	0.62	6	PH
<i>Ochrotrichia</i> sp.	13	4.01	4	PH
<i>Oecetis</i> sp.	3	0.93	8	PR
Total Trichoptera	145	44.75		
<i>Petrophila</i> sp.	3	0.93	5	SC
Total Lepidoptera	3	0.93		
<i>Optioservus</i> sp.	11	3.40	5	SC
<i>Zaitzevia</i> sp.	2	0.62	5	CG
Total Coleoptera	13	4.01		
<i>Simulium</i> sp.	16	4.94	5	CF
Total Diptera	16	4.94		
<i>Cricotopus</i> (Isocladus) Gr.	4	1.23	7	CG
<i>Cricotopus Trifascia</i> Gr.	3	0.93	7	CG
<i>Eukiefferiella Devonica</i> Gr.	19	5.86	8	CG
<i>Eukiefferiella Gracei</i> Gr.	1	0.31	8	CG
<i>Paratanytarsus</i> sp.	7	2.16	6	UN
<i>Polypedilum</i> sp.	50	15.43	6	SH
<i>Rheocricotopus</i> sp.	3	0.93	4	CG
<i>Tvetenia</i> sp.	6	1.85	5	CG
Total Chironomidae	93	28.70		
Grand Total	324	100.00		

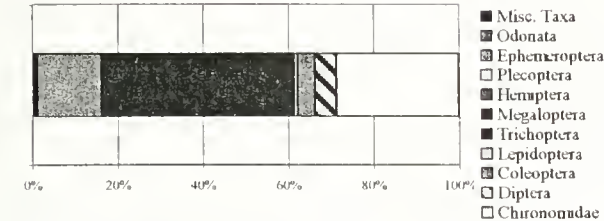
Aquatic Invertebrate Summary

Site Name: Gallatin River near Logan Date: 7/21/01

SAMPLE TOTAL	324
EPT abundance	195
TAXA RICHNESS	28
Number EPT taxa	13
Percent EPT	60.19

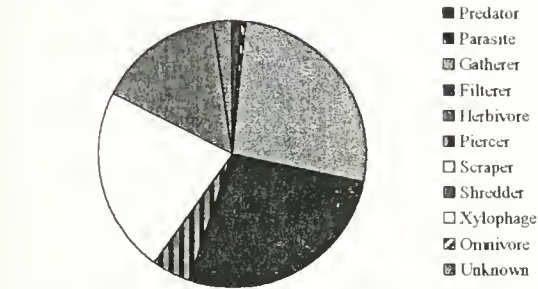
TAXONOMIC COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Misc. Taxa	1.23	3	4
Odonata	0.00	0	0
Ephemeroptera	15.12	4	49
Plecoptera	0.31	1	1
Hemiptera	0.00	0	0
Megaloptera	0.00	0	0
Trichoptera	44.75	8	145
Lepidoptera	0.93	1	3
Coleoptera	4.01	2	13
Diptera	4.94	1	16
Chironomidae	28.70	8	93



FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	1.23	2	4
Parasite	0.31	1	1
Gatherer	26.85	11	87
Filterer	26.85	5	87
Herbivore	0.00	0	0
Piercer	4.63	2	15
Scraper	22.53	5	73
Shredder	15.43	1	50
Xylophage	0.00	0	0
Omnivore	0.00	0	0
Unknown	2.16	1	7



COMMUNITY TOLERANCES

Sediment tolerant taxa	2
Percent sediment tolerant	2.16
Sediment sensitive taxa	1
Percent sediment sensitive	0.31
Metals tolerance index (McGuire)	4.02
Cold stenotherm taxa	0
Percent cold stenotherms	0.00

Site ID: M05GALLR01

DOMINANCE		
TAXON	ABUNDANCE	PERCENT
<i>Helicopsyche borealis</i>	56	17.28
<i>Polypedilum</i> sp	50	15.43
<i>Brachycentrus occidentalis</i>	40	12.35
<i>Baetis tricaudatus</i>	38	11.73
<i>Eukiefferiella Devonica</i> Gr	19	5.86
SUBTOTAL 5 DOMINANTS	203	62.65
<i>Hydropsyche</i> sp	18	5.56
<i>Simulium</i> sp	16	4.94
<i>Ochrotrichia</i> sp	13	4.01
<i>Cheumatopsyche</i> sp	12	3.70
<i>Optioervus</i> sp	11	3.40
TOTAL DOMINANTS	273	84.26

SAPROBITY

Hilsenhoff Biotic Index	4.50
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DIVERSITY

Shannon H (loge)	2.30
Shannon H (log2)	3.32
Simpson D	0.09

VOLITINISM

TYPE	ABUNDANCE	PERCENT
Multivoltine	120	36.88
Univoltine	151	46.45
Semivoltine	54	16.67

TAXA CHARACTERS

	#TAXA	ABUNDANCE	PERCENT
Tolerant	10	144	44.44
Intolerant	0	0	0.00
Clinger	14	232	71.60

BIOASSESSMENT INDICES

B-IBI (Karr et al.)			
METRIC	VALUE	SCORE	
Taxa richness	28	3	
E richness	4	1	
P richness	1	1	
T richness	8	3	
Long-lived	2	1	
Sensitive richness	0	1	
%tolerant	44.44	3	
%predators	1.23	1	
Clinger richness	14	3	
%dominance (3)	45.06	5	
TOTAL SCORE		22	44 %

MONTANA DEQ METRICS (Bukantis 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	28	3	2	2
EPT richness	13	3	2	0
Biotic Index	4.50	3	2	1
%Dominant taxon	17.28	3	3	3
%Collectors	53.70	3	3	3
%EPT	60.19	3	3	2
Shannon Diversity	3.32	3		
%Scrapers + Shredd	37.96	3	3	1
Predator taxa	2	0		
%Multivoltine	36.88	3		
%H of T	21		3	
TOTAL SCORES		27	21	12
PERCENT OF MAXIMUM		90.00	87.50	57.14
IMPAIRMENT CLASS		NON	NON	SLIGHT

Montana DEQ metric batteries

